

§ 17. The Building Stones of the Commonwealth.

1. New South Wales.*

It is doubtful whether any country in the world has greater advantages than New South Wales as regards the possession of practically unlimited quantities of good building material. In the Metropolitan area alone, there are extensive deposits of clay-shales and clay, suitable for the manufacture of excellent bricks, as well as high-grade sandstone for building purposes. And at many centres, convenient to rail or water, throughout the State inexhaustible supplies of granite and other igneous rocks, in addition to limestone, marble, and sandstone are obtainable.

Attention was given to the building stones in the early days of settlement, as is evidenced by the number of old buildings now standing throughout the State, and also by the reference in "Mitchell's Three Expeditions into Eastern Australia," published in 1838, wherein it is stated that "a few miles from Towrang a quarry of crystalline variegated marble has been recently wrought to a considerable extent, and marble chimneypieces, tables, &c., now ornament most good houses at Sydney."

The sandstones of the Sydney district were the first stones to be used in the State, but perhaps not so much care was then exercised in the selection of stone as at the present time. For many years the light brown sandstone of the Sydney district, known in the trade as "yellow block" stone, has been deemed the only "correct" material for buildings of any pretensions. It is about sixty years since quarries were first systematically opened up with the object of obtaining the uniform coloured "yellow block stone." The first of these quarries was started at Pyrmont, close to the site of the present quarry, which is the most extensive building stone quarry in the State. Since then a number of quarries have been opened in the metropolitan area, and although several have been abandoned, the bulk of them are now being worked with rock-cutting machinery of the latest type. The stone occurs as lens-shaped masses associated with other sandstones in what is known geologically as the Hawkesbury Stage of the Triassic Period. The lenses vary considerably in size. When freshly quarried, the stone is fairly soft, and of a white to bluish grey colour, but on exposure hardens rapidly and assumes a light brown colour. The Hawkesbury Series consist mainly of sandstones and grits, and attain a maximum thickness of about 1100 feet in the neighbourhood of Sydney. They outcrop over a considerable area in the State. Many excellent beds of freestone apart from the "yellow block" occur in the Series, and have been extensively quarried, mostly for local building and road-making purposes. The stone is generally of a white or light-grey colour, is probably equal to "yellow block" in strength and durability, and is likely to be used in the future in the construction of large city buildings. The number of large quarries now being worked on this class of stone is too extensive to be included in the accompanying tabulated list.

Other good sandstones occur throughout the State in all geological formations from those of Silurian Age up to Cretaceous, and a number of quarries are worked in country districts to meet local requirements.

* Contributed by E. Fisher Pittman, Esq., A.R.S.M., Under Secretary, Department of Mines, Sydney, at the time when the article was supplied.

Extensive deposits of marble are widely distributed. Although attention has been directed to them since shortly after the foundation of the State, it is only within the past fifteen years that attempts to establish the industry have been successful. During that time a number of quarries have been opened, and within the past twelve years stone to the value of £21,157 has been marketed in Sydney.

The stone varies considerably in colour, pattern and texture, and is eminently suited for architectural purposes, or any description of work for which marbles are employed. Generally the stone is free from flaws and impurity, and, in consequence, it lends itself to thin cutting, and little or no "stopping" is required in the dressed article. Compactness of texture and high compression strength are characteristic of New South Wales marbles.

A white statuary marble has not yet been located in appreciable quantity.

Limestone occurs abundantly, but up to the present only a limited quantity has been used as building stone. The greater number of deposits occur in the eastern and central portions of the State, are very extensive, and belong to several geological ages. They vary from a few chains up to a mile in width, and can be traced for several miles along the line of strike. Practically unlimited quantities of the stone are therefore available. The stone is generally very compact, varies in colour from white to bluish grey, and is well suited for building or ornamental purposes. A number of quarries have been opened and small quantities used locally. The stone is used mainly for the production of quicklime, and in the manufacture of hydraulic cement. Extensive quarries for this purpose are worked at Portland, Taree, and Goulburn.

There are extensive deposits of slate in the State, but all attempts to produce a good roofing slate have, until quite recently, been unsuccessful. Quarries were opened at Moruya, Gundagai, Millamurrah, Caloola, Newbridge, and Grattai, but were abandoned principally owing to the fact that the slates were too hard, and not sufficiently fissile to be profitably worked.

At present there appears to be a reasonable prospect of the slate industry being established in the near future. A belt of slate from 360 feet to 380 feet in width has been located in the Goulburn district. The stone possesses all the qualities for roofing, hearths, slabs, etc., and quarries have been opened up, and up-to-date machinery for dealing with the stone installed.

During the year 1914, 40,000 slates of different sizes were marketed.

Granites suitable for engineering and architectural purposes occur extensively in many parts of New South Wales. They vary considerably in colour and texture, and are equal to most imported granites for building and ornamental purposes. Small quantities have on several occasions been introduced into Australian architecture, but practically no attempt has yet been made to develop the industry, owing probably, to the adequate supply of more cheaply worked stone.

Of recent years a syenite, or what is known commercially as "trachyte," has been extensively used in building construction in the polished and unpolished state.

Other igneous rocks such as porphyries and basalts occur abundantly in the State, but have only been used in small quantities locally for building purposes. Some of the porphyries are very handsome rocks, and well suited for ornamental work.

Serpentine of various shades of green occurs in many districts. The deposits occur in belts extending for considerable distances with broken outcrops. One belt traverses the country for a distance of about 150 miles. The stone is eminently suited for ornamental work, but has so far been quarried for exhibition purposes only. It takes a good polish.

The following tabulated information has been in part compiled from the reports of the Department of Mines, Sydney, and from "Building and Ornamental Stones of Australia," by R. T. Baker, F.L.S., etc.

IGNEOUS ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (red)	Burrinjuck, 220 miles from Sydney.	A light coloured rock composed mainly of quartz and felspar. In places the felspar has a greenish tinge. It is hard and has a high specific gravity, and is a high class building stone.	Practically unlimited. The belt of granite outcrops for over 50 miles both north and south from Burrinjuck.	The dam of Burrinjuck Reservoir is constructed mainly of this granite, some of the blocks used weighing as much as 15 tons.
Granite (red)	Near Lithgow, 100 miles from Sydney.	A good red porphyritic granite.	A large quantity is available.	A small quantity has been used locally.
Granite (red)	Tarana, 120 miles from Sydney.	Both coarse and fine-grained granite of good colour. The coarse rock contains large porphyritic crystals of pink felspar.	Unlimited quantity of either variety available.	This is part of an extensive belt of granite in the central western area. Small quantities have been used locally.
Granite (red and grey)	Trial Bay, 225 miles from Sydney by water.	The red variety is a pale-coloured, coarse-grained stone, while the grey is medium grained and of a fresh grey colour. Both take a high polish.	Practically inexhaustible.	The granite outcrop occupies an area of about 1½ miles square. The prison at Trial Bay is built of these granites.
Granite (grey and red)	Braidwood, 180 miles from Sydney.	Both are coarse-grained rocks with white and pink felspars. The red variety is similar in character to the Gabo Island granite, but rather lighter in appearance.	Practically unlimited. The outcrop is very extensive.	A small amount has been quarried and used locally in the construction of churches and dwellings. The proposed railway from the Federal Capital to Jervis Bay passes over this belt of granite.
Granite (grey and red)	Albury, a border town between New South Wales and Victoria.	Several varieties which vary both in colour and texture, and take a high polish. Both pink and white porphyritic crystals occur through the rock.	Large quantities available.	Two of these are really handsome rocks; in one, the base is grey to green in colour, with large pink felspars, while the other has a grey base with porphyritic white felspars. None of these granites has as yet been quarried for building purposes.
Granite (grey)	Bathurst, 144 miles from Sydney.	A coarse-grained light coloured stone.	Large quantities are available.	Used locally for building purposes.
Granite (grey)	Gunning, 164 miles southerly from Sydney.	A fine-grained horn-blende granite of a dark grey colour. Takes a good polish, and is a free working granite.	Practically unlimited quantities are available. The outcrop extends over an area of at least 24 square miles.	It has been used locally in the construction of the Anglican church and several private houses.
Granite (grey)	Montague Island, 180 miles southerly from Sydney, by water.	A very handsome and distinct granite in which large crystals of felspar (labradorite) are the chief characteristic. It is a hard close grained rock and takes a high polish.	Only a small amount of quarrying has been done, but a very large quantity is available. About two-thirds of the island, or at least 130 acres, is composed of this rock.	This stone is specially suited for ornamental building purposes. It has been used as bases for the columns in the General Post Office, Sydney, in the polished and unpolished state, and in the construction of the lighthouse on the island.
Granite (grey)	Moruya, 196 miles from Sydney, by water.	A medium to coarsely crystalline rock with numerous basic segregation. It is of a light grey colour, and takes a high polish.	Although only a limited amount has so far been quarried, the quantity available is practically inexhaustible. The granite outcrop is very extensive.	The stone has been used in the turned columns in the colonnade of the General Post Office, and in the Custom House and other buildings in Sydney.

IGNEOUS ROCKS—*continued*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (grey)	Tenterfield, 480 miles north from Sydney.	A porphyritic granite with large pink felspar crystals scattered through a grey-coloured ground mass; really a combination of red and grey granite.	The outcrops are very extensive in the district, and indicate a large quantity.	The stone is most attractive in appearance, and is well adapted for ornamental building purposes. Has not yet been utilised in building construction.
Granite (grey)	Uralla, 344 miles northerly from Sydney.	A medium grained hornblende granite of a rich dark grey colour, which takes an excellent polish.	No quarrying has been done, but there is a large quantity available.	This is a very handsome stone and will no doubt be utilised in the near future. It is a splendid ornamental and monumental stone.
Granite (grey)	Young, 256 miles from Sydney.	A medium to coarse grained rock, with abundance of black mica (biotite).	The rock outcrops over a large area, and the quantity available is practically unlimited.	It has been used locally for building churches and private dwellings.
Syenite ("Trachyte")	Bowral, 80 miles from Sydney.	A fine-grained hard crystalline rock of a light grey or dark grey colour. It takes an excellent polish. In crushing strength it is equal to most granites.	It occurs as an intrusive boss, and outcrops over an area of about 40 acres. A very large quantity is available, and extensive quarries have been opened.	The stone which is known in the trade as "Bowral Trachyte" is really a syenite. The light grey stone looks well when roughly dressed, and a very fine architectural effect is produced by relieving it with a certain proportion of the darker stone in a polished condition. In recent years it has been rather extensively used in the polished and unpolished state. Good examples can be seen at the Equitable Buildings, Commonwealth Bank, Mutual Life of New York, and many other city buildings. It has also been used in the piers of the Hawkesbury Bridge.
Trachyte	Orange, 192 miles from Sydney.	A fine-grained hard crystalline rock of a greenish-grey colour with black spots. It is hard and durable, and takes a good polish.	It comprises the bulk of the Canoblas mountains, and a large quantity is available.	It has been used locally for building and paving.
Porphyry	Goulburn, 134 miles from Sydney.	A dense hard dark green rock which when polished is olive green.	A large quantity available.	It has been used locally in the construction of churches and dwellings.
Porphyry	Canberra, the Federal Capital area.	Dense dark coloured quartz porphyries. They split with rather a flinty fracture.	A large quantity available.	The church at Canberra is in part built of this stone.

Other localities worthy of note and convenient to rail or water carriage, where practically unlimited quantities of granite and other igneous rock suitable for building and ornamental purposes are available, are:—

Grey Granite.—Adelong, Arnprior, Bredbo, Bungendore, Burrowa, Cooma, Cowra, Harden, Oberon, Tumut, Glen Innes.

Red Granite.—Cowra, Bungendore, Grenfell, Carrick, near Michelago, Tarago, near Wellington.

Porphyries.—Bredbo, Burrowa, Cowra, Yass.

Tinguanite.—Barrigan.

Basalts.—Guyra, Glen Innes, Blayney, Millthorpe, Inverell, Kiama, Cooma, Nimmitabel, Merriwa, Molong, Orange, Dorrig, Murrurundi, Shell Harbour, Uralla, Werris Creek.

SEDIMENTARY ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Sandstone (white to pink) <i>Triassic age.</i>	Bundanoon, 95 miles from Sydney.	A fine-grained stone varying in colour from white to pink.	A large quantity available.	A quarry has been worked for some years, and the stone used largely in buildings at Goulburn and other towns in the Southern District.
Sandstone (light brown) <i>Triassic age.</i>	Bondi, about 4 miles from Sydney, of which it is a suburb.	A fine to medium-grained stone, which is known in the trade as "yellow block." When freshly quarried it is fairly soft and of a bluish-grey colour, and on exposure rapidly hardens and changes in colour from straw to light brown. Possesses all the qualities of a high-class building stone.	A large quantity available. The bed of stone which is now being worked varies in thickness from 20 feet to 30 feet, and was located in driving a tunnel for the sewerage system of the district.	A large amount of stone from this quarry has been used in a number of buildings in the City. Channeling and guttering machines are employed in winning the stone and, as jointing is not common, blocks up to 5 feet in thickness and of almost any desired length and breadth can be obtained. The stone cuts well and is well adapted for carvings, etc.
Sandstone (light brown) <i>Triassic age.</i>	Maroubra, about 5 miles from Sydney. Two quarries about half a mile apart, one of which is owned and worked by the State Government.	Medium-grained "yellow block" stones. Although possessing all the qualities of the Bondi stone they tone down to a slightly darker colour on exposure, owing to the presence of more iron in the cementing material. They contain as much as 2.07 per cent. ferrous oxide (Fe. O.).	A very large quantity of high-class stone is available from this district. The beds of sandstone which are being worked are on different horizons and vary from 9 feet to 22 feet in thickness. After systematically testing the ground by means of bores, it has been estimated that there is over 2,000,000 cubic feet of good building stone available at the State Quarry.	Both quarries have only been started within the past three years, and a fair amount of stone from each has been used in buildings in the city and suburbs. The stone is cut out by machinery, and blocks of almost any dimensions can be obtained. A considerable amount of machinery has been installed at the State quarry for dressing the stone.
Sandstone (light brown) <i>Triassic age.</i>	Botany, a suburb of Sydney.	Medium-grained "yellow block" stone of good quality.	A fairly large quantity available. The sandstone bed is about 15 feet thick.	A fairly extensive quarry has been opened up, and the product is used in buildings in the city and suburbs. The stone is quarried by hand labour.
Sandstone (light brown) <i>Triassic age.</i>	Pymont, within the city boundary.	Fine to medium-grained "yellow block" stone, possessing all the qualities of a first class building stone. It has been tried for over fifty years and met all the requirements of a high-grade stone.	A considerable quantity available. A very extensive quarry has been worked here for over fifty years. The bed of stone at present being worked is about 35 feet thick, but it runs as much as 51 feet in places.	The stone from this quarry has been used in most buildings of any pretensions in Sydney, and has been exported to Vancouver, Suva, New Zealand, and the sister States. One shipment was sent to England as a trial, when trade was dull in Sydney. This is the most extensive building stone quarry in the State, and as many as 300 men have been employed at one time in connection with the production of dressed and undressed stones. The quarrying is mostly done by hand labour and the use of explosives.
Sandstone (light brown) <i>Triassic age.</i>	Randwick, a suburb about 4 miles from Sydney.	Fine to medium-grained "yellow block" stone, similar to the Bondi stone.	The extent of the bed is not known. There is only a limited quantity available within the area owned by the present quarry proprietor.	A large quarry has been worked for some years, and the stone used in many buildings in Sydney. Both cutting machines and explosives are used in the quarry.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Sandstone (light brown) <i>Triassic age.</i>	Waverley, a suburb of Sydney, about 4 miles distant from the city.	Fine to medium-grained "yellow block" stone, resembling that from Pyrmont.	The extent of the bed is not known, but there appears to be a large quantity available.	A quarry has been worked for some years and the stone utilized in a number of buildings in Sydney. The stone is cut out with channelling machines, and blocks of almost any dimensions can be obtained.
Sandstone (Grey) <i>Permo-carboniferous.</i>	Waratah, 103 miles from Sydney.	Very fine-grained stone varying in colour from light grey to dark grey.	Practically unlimited quantity available. The bed varies from 30ft. to 70 feet in thickness, and can be traced for several miles.	A quarry has been opened, and the stone used largely in the New-castle district. The sandstone forms the floor of the celebrated Borehole Coal Seam in the New-castle district.
Sandstone (Grey) <i>Permo-carboniferous</i>	Ravensfield, 103 miles from Sydney.	Fine-grained stone of a brownish or bluish grey tint. The cementing material is partly lime and partly hydrated peroxide of iron.	The quantity available is practically unlimited. The bed is from 12 feet to 15 feet in thickness, and can be traced for a distance of about 20 miles.	A fairly extensive quarry has been opened up, and the stone used in many buildings in Maitland and other Northern towns. Although some of the stone has been exposed for about thirty years it shows little sign of weathering, the sharp edging of the carvings still being retained. The bed forms a well-marked and persistent horizon in the Lower Marine Series of the Maitland district.
Sandstone (Grey) <i>Silurian age.</i>	Yass, 190 miles from Sydney.	A fairly even-grained sandstone of a grey colour.	Large quantity available.	Quarries have been opened and some of the stone used locally in the construction of churches, etc.
Sandstone (white and light brown)	Undercliffe, 4½ mls. from Sydney.	Both fine and coarse-grained stone, varying in colour from white to light brown. Some "yellow block" stone is obtained here.	Practically unlimited quantities available.	Several quarries are being worked, and the stone used largely in coursing and rubble work. A limited quantity has been used in some city buildings. The quarries are worked by hand labour.

Good sandstones for building purposes which have not been worked to any appreciable extent occur in the following country districts:—Albury, Barber's Creek, near Goulburn, Galong, Grong Grong, Munderooran, Paterson, Muswellbrook, East Maitland, Wollombi, Morpeth, Greta, Rutherford.

In the Metropolitan area small quarries are worked in a number of the suburbs, and produce sufficient good building stone to meet local requirements.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Marble (red) <i>Devonian age.</i>	Attunga, 295 miles northerly from Sydney.	A brecciated marble composed of pale coloured fragments, varying from an inch to 1 foot in diameter, embedded in a red ground mass. Takes an excellent polish.	A very large quantity is available.	One of the most handsome brecciated marbles in the State, and well adapted for large panel work. Only quarried for exhibition purposes.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Marble (mottled) <i>Silurian age.</i>	Caleula, 215 miles from Sydney.	A compact to crystalline marble. The variety which is mainly quarried is white and pinkish mottled stone with green streaks of chloritic material.	A fairly large quantity available.	A considerable amount of this stone has been used recently for indoor decorations in many buildings in Sydney. It has been extensively used as wall panels in the recently built Permanent Trustee Co.'s Offices in Sydney.
Marble (red and grey) <i>Silurian age.</i>	Borenore, 206 miles from Sydney.	Several brecciated varieties occur here. They range from fine to coarsely crystalline in texture, and vary much in colour. Only two varieties are at present being utilized. (1) Breccia of various shades of red showing many fossils. (2) Breccia of a white to grey colour showing numerous encrinite fossils. This is known in the trade as "Borenore Blue." Both take a high polish.	Practically unlimited quantity available. The limestone is exposed for a distance of about two miles across the belt, and for about 1½ mls. along the strike.	Four quarries have been opened, and a very large amount of stone produced. It is sent to Sydney in blocks and sawn into slabs, etc. Up to the present more of the red marble has been utilized than any other marble in the State. It has been exported to the other States. Both the grey and red have been extensively used for interior and exterior decorations in a large number of buildings in New South Wales.
Marble (white) <i>Silurian age.</i>	Caloola, 170 miles from Sydney.	A coarsely crystalline rock of a white colour, with greyish streaks and clouds. Takes a high polish.	A large quantity available. The rock outcrops over an area of ten acres round the quarry, which has been worked for the past twelve years.	The stone has been extensively utilized in Sydney for indoor decorations, such as wall facings, tessellated pavements, and many other purposes. Examples may be seen in the vestibules of Challis House and Prince Alfred Hospital. Machinery is used in the quarry for cutting out the stone.
Marble (mainly red) <i>Silurian age.</i>	Fernbrook, 150 mls. from Sydney.	A number of varieties, mainly red, varying in texture occur in the district and take a good polish.	Large quantities available.	A small quarry has been opened, and a plant installed for cutting the blocks into slabs, but up to the present very little has been put on the market. The marbles from here will no doubt be utilized in the future.
Marble (white and red) <i>Silurian age.</i>	Marulan, 114 miles from Sydney.	Several varieties varying in colour and texture. One variety which should receive attention is a very handsome rock of a white colour with streaks and blotches of grey and red, and in places resembling the Mexican "Onyx" in texture and translucency.	Practically unlimited quantity available.	It was used in mantelpieces in the early days of the colony, but little has been utilized in recent years. A considerable amount has been quarried for the production of lime.
Marble (grey) <i>Silurian age.</i>	Molong, 216 miles from Sydney.	A fine to coarsely crystalline grey rock with white streaks.	The outcrops are very extensive, and the quantity available is practically inexhaustible.	Used locally for building and other purposes. None of the stone has yet been placed on the Sydney market.
Marble (red) <i>Devonian age.</i>	Nemingha, 287 mls. from Sydney.	A medium-grained rock with numerous fossil encrinites. The ground mass is of a rich red colour, and the fossils, which are white, are thickly studded in it. Takes an excellent polish.	A fairly large quantity available.	A small amount was quarried and placed on the Sydney market some 25 years ago, but it has received little attention since then, although it is one of the most handsome marbles in the State.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Marble (black and white) <i>Silurian age.</i>	Rockley, 166 miles from Sydney.	A medium-grained black ground, studded with fossil crinoid stems. Takes a high polish.	A very large quantity available.	A really handsome marble. It has been used in the staircase of the Sydney Art Gallery and for mantelpieces, etc.
Marble (black and white) <i>Devonian age.</i>	Rylstone, 149 miles from Sydney.	A medium-grained dark grey to black, veined with white. Takes an excellent polish.	Practically unlimited quantity.	A quarry has been opened and a fair amount of stone placed on the market for panels and other decorative purposes.
Marble <i>Devonian age.</i>	Rylstone, 149 miles from Sydney.	Several varieties scattered throughout the district. (1) "Cudgegong Ivory." A very fine grained rock ranging in colour from cream to red with dark veins. (2) "Cudgegong Golden." A brownish yellow ground with lighter rings and veins; extremely fine in texture. (3) "Carwell Satin Grey." A cloudy dark satin grey with lighter coloured patches; of fine texture.	Large quantities of each variety available.	These varieties are in course of being placed on the market. They can be obtained in fair sized blocks. The "Cudgegong Golden" is a unique stone and likely to be largely utilized.
Marble (black) <i>Silurian age.</i>	Spring Hill, 187 miles from Sydney.	A beautiful very dark grey to black with white veins and the fossil-shell <i>Pentamerus</i> scattered throughout the mass.	A large quantity available.	The stone has been used largely in a number of buildings in Sydney both for interior and exterior decoration. A good example may be seen at Messrs. Richardson and Wrench's Offices, Pitt Street, Sydney.
Marble <i>Carboniferous age.</i>	Warialda, 405 miles north of Sydney.	Several varieties occur here. (1) Red and white mottled marble of medium texture. (2) White with greyish streaks. (3) Grey to greenish base with white patches and streaks.	Large quantity available.	Used locally for building purposes. None of these marbles have yet been placed on the Sydney market.
Marble (black) <i>Silurian age.</i>	Windellama, 138 miles from Sydney.	A fine-grained dense black marble. Takes a good polish.	Quantity unknown.	The marble has so far only been quarried in small quantity.
Marble (white) <i>Silurian age.</i>	Yass, Coolalie, 190 miles from Sydney.	White and variegated marbles are being quarried, and a black variety occurs close by.	Large quantity available.	The stone is quarried mainly for lime, but small amounts are used locally as building stone.
Marble (red) <i>Permo-Carboniferous age.</i>	Kempsey, 311 mls. from Sydney by water.	A medium-grained marble. The ground mass, which is of a red to reddish brown, is studded with small white crinoid stems, and throughout the whole run veins of a white colour. Takes a high polish.	Practically unlimited quantity available.	This is a very fine ornamental marble and eminently suited for decorations on a large scale. The large columns in the National Art Gallery are made of this marble.

Other localities from which large quantities of first-class marble of various shades and patterns, and suitable for ornamental and building purposes can be obtained are:—Binalong, Bingera, Bowan Park, Buckeroo, Bungonia, Burrowa, Cooma, Cow Flat, Cudal, Gilmore, Goulburn, Michelago, Mudgee, Queanbeyan, Tarago, Tumut.

Limestone.—Extensive belts of limestone occur in the State, but up to the present a very limited quantity has been used as building stone. Generally the deposits are of exceptional purity, and little difficulty should be experienced in obtaining practically

unlimited quantities of stone containing from 90 per cent. to 95 per cent. calcium carbonate. Limestones suitable as building stones occur in very great quantities in the following districts:—Kempsey, Taree, Tamworth, Mudgee, Rylstone, Wellington, Molong, Rockley, Bathurst, Trundle, Marulan, Goulburn, Tarago, Michelago, Cooma and Yass.

SEDIMENTARY ROCKS—continued.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Slate (Blue and green) <i>Ordovician</i> .	Chatsbury, some 17 miles from Goulburn, and 143 miles from Sydney.	The texture is uniformly fine. A few belts of relative hardness occur, but even these are fine in texture and quite suitable for roofing slate. An analysis of the slate gave a return of 66.60 per cent. silica, 16.14 per cent. alumina, 6 per cent. iron oxides, 0.54 per cent. lime and 2.56 per cent. magnesia. It possesses all the qualities of a good roofing slate.	A large quantity available. The width of the good slate belt, as measured across the strike of the beds, is from 360 feet to 380 feet.	Quarries have only recently been opened up. An up-to-date plant has been installed and considerable stripping done. Ten men were employed during the year 1914, and some 40,000 slates of different sizes were marketed for a return of £250.

2. Victoria.*

Victoria is rich in building stones, and certain of the granites, sandstones, marbles, limestones, and basalts have, from time to time, been freely utilized.

The following information has been compiled from reports supplied by officers of the Geological Survey, and from publications issued by certain Victorian Scientific Societies. "The Building Stones of Victoria," Part 1; "Sandstones," by Henry C. Richards, M.Sc. (Proc. Royal Soc., Vic., Vol. XXII. (N.S.), Part 2, 1909); and "Victorian Limestones," by Frederick C. Chapman, A.L.S., F.R.M.S. (Proc. Vic. Inst. of Architects, Vol. X., No. 1, 1912), have been freely consulted.

The more important granites, basalts, sandstones, marbles, and limestones are reviewed, with their localities, general character, and quantity. Examples of the stones may be seen in many of the buildings around Melbourne, and are referred to in the tabulated information herewith.

IGNEOUS ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (salmon red)	Point Woolamai, Phillip Island. 90 miles from Melbourne by water.	A medium to coarsely crystalline rock, which takes a fine polish.	There is a large quantity available and a quarry has been opened near the water's edge.	This stone has been utilized in the Equitable Insurance Building, Collins Street, Melbourne.
Granite (brown red)	Werribee River, 5 miles from Bacchus Marsh, and about 36 miles from Melbourne by rail.	A finely crystalline rock which takes an even polish.	The quantity has not been ascertained.	None of this red brown granite, which is considered one of the best in the State, has, as yet, been quarried.
Granite (bright red)	Gabo Island, off the extreme east coast of Victoria, and about 340 miles from Melbourne by water.	A fine to medium crystalline rock of uniform texture.	A large quantity of handsome stone is available, but only a small amount has been quarried.	This stone is specially suitable for ornamental building purposes. It has been used in parts of the Customs House, and the Australian Insurance Co. Office, Melbourne.

* Data supplied by the Secretary for Mines, Mines Department, Melbourne.

IGNEOUS ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (grey)	Trawool, near Yea, 60 miles from Melbourne by rail.	A coarse granite with one of its felspars occurring as porphyritic white crystals throughout the mass. It is darker than the Harcourt stone and approaches a green-grey colour.	Plenty of good stone is available, and the quarry is close to the railway line.	Examples of this stone can be seen at Sargood Bros.' and Griffiths Bros., Buildings, Flinders Street, Melbourne.
Granite (dark grey)	Dandenong, 19 mls. by rail from Melbourne.	A finely crystalline rock of even texture, and retaining a fine polish.	A large quantity should be available.	Has not been quarried.
Granite (grey)	Harcourt, north of Castlemaine, 53 m. by rail from Melbourne, and within 4 miles of the Harcourt railway station.	A medium to coarsely crystalline light-grey coloured rock. For durability and usefulness it compares favorably with any of the Victorian granites.	This stone can be obtained in huge blocks. A large quarry has been opened and much of the granite utilised.	Examples of this stone may be seen at the Equitable Buildings, Collins St.; Princes Bridge; the State Savings Bank, Elizabeth St.; and Parliament House, Spring St., Melb.
Porphyry (dull pink)	Wangaratta, about 147 miles from Melbourne by rail.	A dense finely crystalline rock. The dull pink colour gives the stone, though mottled, a warm tone. It should prove a most durable and useful stone.	A large quantity is available, and it has been quarried in recent years.	"Collins House," in Collins St., near Queen St. Melbourne, is partly built of this stone. The Roman Catholic Cathedral at Wangaratta is another example.
Gabbro (dark green)	Dewing's Ford, 8 miles west of Geelong. Geelong is 50 miles from Melbourne by water, and 45 miles by rail.	A fine to medium crystalline rock of even texture and green colour. It should be well adapted for ornamental building purposes, but would be expensive to work on account of its hardness.	The outcrops of this rock are extensive, and indicate a large quantity.	Samples of this gabbro have been polished and show it to be an extremely handsome stone. No quarry has, as yet, been opened, nor any of the stone practically utilised.

Other localities worthy of mention, where granites suitable for building purposes occur, include Mt. Martha, Beechworth, Tallangatta, and Somerton.

IGNEOUS ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Basalt (dark blue-grey)	Lethbridge, 66 mls. by rail from Melbourne.	A close crystalline dark basalt. It is free from flaws, and dresses well.	A large quantity available. Large slabs have been quarried.	Used for certain parts of the Railway Buildings, Spencer St. Melbourne, the steps of Parliament House, Records Office, Crown Law Offices, and the Government Offices, Spring St., Melbourne.
Basalt (dull blue-grey)	Malmsbury, about 64 miles from Melbourne by rail.	Of slightly open texture and subject to joints, but large blocks are obtainable.	Large quantities of useful stone available.	The foundations of State Govt. Offices, Spring St., and the Records Office, Melbourne, are of this stone. It is much used in kerbings, and for foundations for monumental work.
Basalt (dark blue-grey)	Footscray, 4 miles from Melbourne.	A dense, dark blue basalt.	Large quantities available. Extensively quarried.	Some examples of this stone may be seen at St. Patrick's Cathedral, and the Telephone Exchange, Melbourne.

In addition to the preceding there are numerous basalt quarries in Victoria, those around Melbourne including Collingwood, Burnley, Clifton Hill, and Sunshine. All these basalts are valuable for paving and kerbing, and some of them, on account of their high specific gravity, have been used for pier and breakwater construction.

SEDIMENTARY ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Sandstone (white) <i>Carboniferous age.</i>	At the foot of the Grampian Ranges, 17 miles north-west of Stawell. The quarries are 172 miles from Melbourne by rail, a branch line connecting with the main trunk line at Stawell.	A very hard and compact stone, accompanied by segregation patches and veins of silica, the presence of which renders the stone expensive to dress.	Large quantities of uniform stone are available, and several quarries have been opened.	Buildings of this stone are:—Parliament House, Melbourne; portion of the National Museum, Melbourne; and recent additions to the General Post Office and Town Hall, Melbourne.
Sandstone (light brown) <i>Carboniferous age.</i>	Mount Abrupt, 3 miles from Dunkeld, which is 179 miles from Melbourne by rail.	A fine even-grained stone. One defect of this stone is the current bedding.	The stone has not been used to any extent. There is a large quantity obtainable.	Examples may be seen at the Women's Hospital, Carlton; and the Presbyterian Church, Hamilton.
Sandstone (light green-brown) <i>Jurassic age.</i>	Barrabool Hills, 5 miles west of Geelong, which is 45 miles by rail from Melbourne.	A fine even-grained soft sandstone. The stone is fairly uniform in texture, and the colour varies from a green-brown to a blue-grey. Grit bands occur here and there, but the stone dresses easily. It is only a fair stone considering the manner in which it weathers.	Large quantities of this stone are available. There are several large quarries which have been operated from time to time.	The old Police Court, and portions of the St. Paul's Cathedral, Working Men's College, Ormond College, and the Medical School Buildings, Melbourne, were partly built of this stone.
Sandstone (light brown) <i>Jurassic age.</i>	Apollo Bay, Otway, about 100 miles from Melbourne by water.	A fine even-grained sandstone somewhat similar to the Barrabool stone, but it weathers better.	Stone of this class occurs in quantity along the coast near Apollo Bay, and a quarry has been opened.	It has not been used to any extent. Examples are the recently built Windsor Exchange, and the Cape Otway Lighthouse.
Sandstone (light brown) <i>Permo-carboniferous age.</i>	Bald Hill, 3 miles from Bacchus Marsh, which is 32 miles from Melbourne by rail.	A soft even-grained sandstone, not very compact, iron-stained, and not uniform in hardness. It does not stand the weather well, and frets away easily.	A large quantity of this stone is obtainable, and it has been much used in the Bacchus Marsh district.	The Treasury Building, Melbourne, is built of this stone and many of the blocks have had to be replaced on account of weathering.
Sandstone (light buff) <i>Permo-carboniferous age.</i>	Darley, 6 miles to the north of Bacchus Marsh, and near Coimaidai. Bacchus Marsh is 32 miles by rail from Melbourne.	This stone is soft and fine-grained, and, as far as worked, proves of a poor quality.	Several small quarries have been opened.	The stone has been used in the Parliamentary Library, Melbourne, and the Treasury, Melbourne, to replace the defective blocks, but with little improvement.
Sandstone (white) <i>Ordovician age.</i>	Moorabool River, near Egerton. The nearest railway station is Gordons, 57 miles from Melbourne.	Both fine and coarse-grained sandstones occur. Both are very clean, and easily dressed.	At one exposure there is a fair thickness of fine compact stone of uniform colour.	It has been used locally for building purposes.
Sandstone (white to brown) <i>Permo-carboniferous age.</i>	Ballan district, notably at Pentland Hills, Pyke's Flat, and Greendale. Ballan is 50 miles from Melbourne by rail.	The Ballan stone is close-grained and white. The Pyke's Flat stone is of a blue-white colour, and is open-grained. The Pentland Hills stone is of a light brown colour; and that from Greendale a white to brown coloured serviceable stone.	The quantities available should be large.	These have only been utilized locally.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Marble (dark grey and dove-coloured, etc.) <i>Devonian age.</i>	South Buchan, E. Gippsland, 16 miles north of Nowa Nowa, which is 200 miles from Melbourne by rail.	Compact limestone or marble. Three varieties occur:— (i.) Dove-grey showing many fossils; (ii.) Dark grey showing many fossils; (iii.) Black with white veins or streaks.	Large quantities of the marble are available.	These marbles have been used in the additions to the Public Library, Melbourne, Carlyon's Hotel, Spencer Street, Majestic Theatre, Flinders Street, and the Commonwealth Offices, Melbourne. Two quarries are now working to supply marble for the Commonwealth Offices, London. At the Panama Pacific Exhibition, 1915, a gold medal was awarded for an exhibit of this marble.
Marble (various colours) <i>Silurian and Devonian ages.</i>	Limestone Creek, county of Benambra, N. Gippsland, over 100 mls. by road from Bairnsdale, which is an additional 171 miles by rail from Melbourne.	Handsome marbles of various colourings occur. Red mottled, red brecciated, green mottled, pink, white and blue-grey streaked, and white and yellow streaked are the main varieties.	Large quantities of the marble occur, but the development of these deposits is retarded by want of railway communication.	This marble has, so far, been quarried for exhibition purposes only.
Marble (grey encrinital) <i>Silurian age.</i>	Thomson River, near Toongabbie, Gippsland. Toongabbie is 109 miles from Melbourne by rail.	A compact limestone showing numerous encrinite fossils.	A considerable quantity is probably available, and some quarrying has been done.	It has been used for mantelpieces and table tops.
Marble (salmon pink and grey and dove-grey)	Martin's Creek, 20 miles north of Orbost on the Orbost-Bendoc road, East Gippsland. Orbost is within 230 miles of Melbourne, and will be shortly served by rail.	A very handsome marble of salmon pink and dove grey colour, compact and solid.	Large quantities are available, and a quarry has been opened.	Used in construction of the Agent-General's Office, London. An exhibit sent to the Franco-British Exhibition, 1908, gained a certificate and medal.

Palaeozoic marbles also occur at Mt. Wellington (Gippsland), Lilydale, Loyola, Deep Creek (Walhalla), Tyers River, Waratah (South Gippsland), and at Bindi, Wonnangatta, and Wombat Creek (North Gippsland). These have not yet been quarried, although some of them may in future prove to be of importance.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Limestone (yellow to red) <i>Janjukian age.</i>	At Batesford, Moorabool River, 5 miles north-west of Geelong, which is 45 miles by rail from Melbourne.	A yellow to red limestone composed of numerous fossils cemented together by a crystalline calcite base.	Large quantities available along the Moorabool River Valley.	This limestone has been used in the new Police Court Buildings, Melb., in the facings of the Malvern Post Office, and in the Roman Catholic Cathedral, Bendigo.
Limestone (snuff-brown colour) <i>Janjukian age.</i>	Waurin Ponds, 6 m. south-west of Geelong, which is 45 miles by rail from Melbourne.	An impure limestone containing iron oxide and clayey matter. It makes a fair building stone when carefully selected.	A large quantity is available, and several quarries have been worked on and off for many years.	It has been utilised in the construction of parts of the Working Men's College, St. Paul's Anglican Cathedral, and the Railway Viaduct Buildings, Melbourne.
Limestone (white) <i>Janjukian age.</i>	Portland, 251 miles from Melbourne by rail. Water carriage also available.	A white polyzoal limestone resembling the Mt. Gambier limestone. It is reputed to harden on exposure.	There appears to be a considerable thickness of this limestone.	It would probably make a good building stone.

Other Tertiary limestones of Janjukian age, and of less importance, but suitable as building stones, occur at Torquay, Drysdale, and Grange Burn. At Sorrento and Warrnambool some recent limestones (dune limestones of Pleistocene age) have been used locally for building purposes, being sometimes very hard and durable.

Flagstones and slates occurring in Victoria have been quarried for paving and building purposes. At Castlemaine useful flagstones have been largely employed for paving and hearthstones. A number of quarries were formerly in operation at Castlemaine, and large quantities of stone were made available for the Melbourne building trade, but at present there is no demand for the stone.

At Percydale slates have been quarried for hearthstones, and flagstones of slate were at one time much used. At Gisborne, Glenmaggie, Meredith, and Nowa Nowa, useful slates are known to occur, and those at Nowa Nowa will be fairly accessible on the completion of the Bairnsdale-Orbost railway.

3. Queensland.

Unfortunately there is not sufficient information available to permit of a detailed statement being given in regard to the quantity and quality of Queensland building stones.

4. South Australia.*

The principal building stones that have been employed in the construction of public and private buildings in the State of South Australia are mentioned in the accompanying table. In addition to those which appear in the table there are many others in various parts of the State which are used locally to a limited extent.

It will be seen that the great series of sediments of Cambrian age contributes a considerable portion of the building stone used in the State, and the Tertiary system provides important and useful limestones and dolomite.

There are many known occurrences of rocks which may in the future be utilized as materials of construction, but which have remained undeveloped owing to their relative inaccessibility. For example, the granites at Wudinna and Moody have recently had transport facilities provided by the construction of railway lines on Eyre's Peninsula. Other granites, suitable for building purposes, are those of Midgee, 25 miles north-east of Franklin Harbour, and Cape Willoughby at the eastern extremity of Kangaroo Island.

The felspar porphyry, the largest development of which is in the Gawler Ranges, is a very handsome rock, and would provide excellent material for decorative work or for composite artificial stones.

The Pre-Cambrian sediments of Eyre's Peninsula comprise some marbles which may prove useful in the future. The white marble of medium grain found at Ulgera Gap, 11 miles north-west of Cowell, is perhaps the most accessible of these.

IGNEOUS ROCKS.

Building Stone.	Locality.	Character.	Adaptability and Quantity.	Examples.
Granite <i>Palæozoic</i>	West Island, 1 mile S.W. of Rosetta Head, Encounter Bay; about 100 miles by sea from Port Adelaide.	A coarse-grained grey granite, porphyritic through development of large felspar crystals. Resembles the granite of Granite Island and Port Elliott.	Excellent material, and probably the most advantageously situated development of granite in the State. Has been used principally in the construction of bases for important city buildings. Very large quantity available.	Base courses and steps of Parliament House and St. Peter's Cathedral, Adelaide. Bases of the Bank of Australasia and the Bank of New South Wales, Adelaide.

* Data supplied by L. Keith Ward, Esquire, B.A.B.E., Government Geologist, South Australia.

IGNEOUS ROCKS—*continued.*

Building Stone.	Locality.	Character.	Adaptability and Quantity.	Examples.
Granite <i>Palæozoic</i>	Swanport, 3½ miles S. S. E. of Murray Bridge, which is 60 miles by rail from Adelaide.	A coarse-grained and pale reddish rock, the colour of which is best shewn by polished surfaces. The roughly-dressed rock is more nearly grey than red.	Can be readily dressed to specified shapes, and polishes well. It makes a handsome and reliable stone for foundations, base courses and monuments. A large quantity available.	Base courses of the Adelaide Railway Station, the new Education block, the Savings Bank, National Mutual Buildings. Bases of the Soldiers' Monument, North Terrace; Colonel Light's and Kingston's statues, Victoria Square; Hughes' Statue at the University of Adelaide.
Granite <i>Palæozoic</i>	Palmer, 1 mile N. W. of Palmer and 11 miles W. N. W. of Mannum on the Murray, 40 miles by road from Adelaide.	A coarse-grained granite, porphyritic in part, and to a certain extent gneissose in structure. The colour is pale reddish.	Good material, but handicapped by its position. Very little worked. It is used for the same purposes as those to which the Swanport granite has been applied. Very large quantity available.	Base of the Queen's Statue, Victoria Square. Base courses of the Beehive Buildings, King William Street, Adelaide.
Granite <i>Palæozoic</i>	Monarto, on the Railway line, 3¼ miles E. of Monarto Railway Station and 55 miles from Adelaide.	A pale grey granite of medium to fine grain. The structure is slightly gneissose.	Suitable for foundations and bases, but hitherto neglected in favour of the coarser grained varieties from Swanport and Encounter Bay. Very large quantity available.	A considerable quantity is used by the Municipality of Adelaide for kerbing in the city streets, also facings of the South Australian Gas Company's premises, King William Street, Adelaide.

SEDIMENTARY ROCKS.

Slate <i>Cambrian</i>	Mt. Lofty Ranges near Adelaide; chiefly at: Glen Osmond, 4 miles by road S. E. of Adelaide; Mitcham, 4 miles by road S. of Adelaide; Tapley's Hill, 8 miles by road S. S. W. of Adelaide.	A dark bluish to yellowish grey clay slate. The rock is thin-bedded, but does not cleave readily along the bedding planes. The joint-planes are somewhat irregularly disposed, and are tinted various shades of yellow and brown by oxide of iron.	The rock is quarried in blocks of convenient size for building purposes, and the blocks are bounded by approximately rectangular faces. The stone is usually employed with the iron-stained joint planes as facers, and the variegated appearance of large walls is pleasing. The buildings constructed mainly of this stone are dressed with sandstone, limestone, brick, or cement. This slate is used in the base courses of many buildings in Adelaide. Very large quantity available.	The Stow Memorial Church and the Baptist Church, in Flinders St., Adelaide, are examples in which the dressings are of sandstone. The Government Printing Office is an example in which the Murray Bridge limestone is used for dressings. Innumerable public and private buildings in Adelaide are constructed of this stone.
Slate <i>Cambrian</i>	Various places on the northern railway line, chiefly at: Auburn, 7½ miles by rail from Adelaide; and Tarlee, 54 miles by rail from Adelaide.	A rock varying from a thin-bedded clay slate to an argillaceous sandstone, and readily cleavable with the bedding planes into blocks or flags. The unweathered stone is dark slate-blue in colour, and the weathered material brownish grey. Joint planes are stained brown by oxide of iron.	Easily worked stone, obtainable in sizes and shapes convenient for use in building construction. Variable results have been obtained from this stone, but the best material is of good quality. Careful selection of stone in some quarries is necessary, for the good stone is in some places associated with material that rapidly frets away. Very large quantity available.	The Auburn slate has been used for the base courses of the Adelaide School of Mines, and for many buildings at Auburn. Tarlee stone is used in the base of the brick portion of the Museum, and in the construction of many railway stations, e.g.—Burra, Farrell's Flat, Riverton, Roseworthy, and Adelaide. It is also used in the Islington Railway Workshops.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Adaptability and Quantity.	Examples.
Flagstone <i>Cambrian</i>	Mintaro, 5½ miles west of Mintaro railway station, which is 83 miles north of Adelaide.	A dense bluish-grey slate or argillaceous sandstone, readily cleavable into flags. The cleavage is coincident with the bedding planes. Very large flagstones are obtainable.	It is used for all purposes to which a high-class flagstone may be put. The quality is unsurpassed, and the reliability has been proved by over 40 years of wear. It has proved adaptable for use in interiors as well as in pavements and steps exposed to the weather and to heavy traffic. Very large quantity available.	As hearthstones, sills, steps, corridor flooring, and paving stones, etc., in many public and private buildings in South Australia. It has been used in the construction of the corridor floors in Parliament House, Adelaide, and of the shelving and corridor floors of the Lands Titles Offices, Melbourne.
Roofing Slate <i>Cambrian</i>	Willunga, 34 miles by rail from Adelaide.	A thin-bedded bluish grey slate, the cleavage of which is coincident with the bedding-planes. The prepared slates are thicker and softer than the best Welsh roofing slates, and the thickness cannot be reduced without sacrificing strength. All workings are shallow and the quality of slates may improve in depth.	It has been used chiefly for roofing private dwellings. Attempts to use the thicker slates as flagstones have not been successful, as the stone is too soft and apt to flake. Very large quantity available.	The roofs of most buildings at Willunga, and of many houses in Adelaide, Melbourne and Sydney.
Limestone <i>Tertiary</i>	Murray Bridge; chief quarries are situated on the left bank of the river, 1 mile south of Murray Bridge, which is 60 miles by rail from Adelaide.	A light, buff-coloured stone, the texture of which is on the whole even and the grain fine. Shells are visible in parts of the rock. The stone, as quarried, requires careful picking in order to remove portions traversed by pipe-like cavities which are either void or filled with clay.	The rock has been used effectively on a large scale in many public buildings, either as the principal material of construction or in the form of dressings for buildings constructed mainly of slate. Very large quantity available.	The Art Gallery, Public Library and Museum, North Terrace, Adelaide; The Register Buildings, Grenfell Street; the superstructure of St. Peter's Cathedral. The dressings of the Government Printing Office, Adelaide.
Limestone <i>Tertiary</i>	Mt. Gambier and vicinity. Mount Gambier is 305 miles by rail from Adelaide.	A white porous-textured limestone, composed largely of polyzoal remains. It is soft and easily worked when freshly quarried, but hardens on exposure. It is obtainable in very large blocks.	It can be readily obtained at a low cost in any form desired. The porosity is so marked that buildings constructed of this stone are almost invariably built with hollow walls. It is used in some cases for dressings in buildings built of other limestone, but in Mt. Gambier it is customary to use the polyzoal limestone as the chief building material with dressings of dolomite. Very large quantity available.	The Convent of Mercy, the Methodist Church, the High School, and the Commercial Flour Mills at Mt. Gambier. Many private buildings in the Southern district. In the form of quoins and dressings in the Institute and Presbyterian Church at Penola, and in the Institute at Naracoorte.
Travertine Limestone <i>Tertiary to Recent</i>	Northern suburbs of Adelaide and many other places in the State.	A yellowish limestone, generally showing concretionary structure.	A hard and durable stone, obtainable in small blocks and more suitable for building private houses than for larger structures. Very large quantity available.	Many residences in the older parts of North Adelaide; the old portion of the Adelaide Railway Station; Alberton and Bowden Railway Stations.
Limestone <i>Tertiary to Recent</i>	Near Port Lincoln, in low lying areas.	Soft white limestone, hardening on exposure.	Suitable for small buildings and private residences. Large quantity available.	Many houses at Port Lincoln.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Adaptability and Quantity.	Examples.
Dolomite <i>Tertiary</i>	Near Compton, about 6 miles N.W. of Mt. Gambier, which is 305 miles by rail from Adelaide.	Crystalline dolomite, either grey or yellowish red in colour.	A dense rock which is more costly to quarry and dress than the polyzoal limestone, and hence used principally in the form of dressings for buildings constructed of the latter rock. Large quantity available.	Red dolomite is used in the columns of St. Peter's Cathedral, Adelaide; in Hospital, Town Hall, the Institute, and Blue Lake Pumping Station at Mt. Gambier. Dolomite is also used in many private buildings at Mt. Gambier.
Marble <i>Cambrian</i>	Angaston; 1½ miles south of Angaston railway station, which is 51½ miles from Adelaide.	Coarse-grained white, grey and pink marble, the grey varieties being most abundant and the pink the rarest. Different shades of colour are closely associated.	Very large blocks are obtainable and the stone lends itself to high-class architectural work and to large structures. The grain is too coarse for fine work. The stone has been much in demand for monumental work, and has also been used in the form of flagstones. Very large quantity available.	The Mechanics' Institute at Angaston is built of stone of two shades, grey and almost white. Many dwelling houses in the Angaston district are built of this marble. Pale grey stone is being shipped to London for use in the construction of Australia House.
Marble <i>Cambrian</i>	Kapunda; 8 miles S.E. of Kapunda, which is 48 miles by rail from Adelaide.	Coarse-grained white, grey and cream coloured marble. The grey-tinted stone closely resembles that of Angaston.	This marble has been applied to the same uses as that from Angaston. It is rather less easy to work, and is less accessible. Very large quantity available.	The superstructure of Parliament House, Adelaide.
Marble <i>Cambrian</i>	Macclesfield; 1 mile west of Macclesfield, which is 25 miles by road from Adelaide.	Medium to fine-grained and pink marble. The pink variety is streaked with grey.	A handsome stone which takes a splendid polish. The parti-coloured varieties are specially suited to decorative and monumental work. Very large quantity available.	The Clarendon weir across the Onkaparinga River is faced with massive blocks of this marble.
Sandstone <i>Cambrian</i>	Tea Tree Gully, 13 miles by road N.E. of Adelaide.	White to light buff-coloured stone of even texture.	A sandstone that dresses well and has proved very durable. It may be used with advantage by itself or in the form of dressings in buildings constructed mainly of Mitcham or Glen Osmond slate. It has resisted weathering better than any other South Australian or imported sandstone in Adelaide buildings. Very large quantity available.	The Law Courts, Adelaide; the Town Hall, Adelaide; the old portion of the General Post Office, Adelaide.
Sandstone <i>Cambrian</i>	Aldgate; half-mile W. of Aldgate Railway station, which is 23 miles from Adelaide.	White to light buff-coloured stone of variable quality. In part argillaceous and friable.	This stone is apt to fret on exposure. It is very soft when quarried. Large quantity available.	The Elder Hall, University of Adelaide; the piers of St. Peter's Cathedral.
Sandstone <i>Probably Permo-carboniferous</i>	Finniss River; 2 miles N.W. of Finniss railway station, which is 60 miles from Adelaide.	Pale grey to buff-coloured stone, part of which is notable for a highly-contorted grain which becomes more and more prominent on dressed surfaces as weathering proceeds.	Stone hitherto quarried is of rather variable quality. The sawn surfaces become very rough on long exposure and the stone is apt to fret away. Large quantity available.	The superstructure of the Bank of New South Wales, Adelaide; the pillars and coping stones, University Gates; the Strathalbyn Railway Station.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Adaptability and Quantity.	Examples.
Sandstone Cambrian	Mt. Lofty Ranges near Adelaide, notably: Sheoak Hill, 2 miles E.S.E. of Belair which is 14 miles by rail from Adelaide; immediately to S. of Mt. Lofty railway station, 19½ miles from Adelaide; Mitcham, 5 miles by road S. of Adelaide; Glen Osmond, 5 miles by road S.E. of Adelaide.	Soft pale buff-coloured sandstone, which hardens somewhat after being quarried.	Suitable for small buildings, such as residential villas, of which it forms either the walls or base courses. It is in very many cases used with dressings of red brick. Very large quantity available.	Many private residences in and around Adelaide.

5. Western Australia.*

Western Australia is particularly rich in building stones, but, owing to the fact that the sedimentary series occupy but a very limited area, it naturally follows that they for the most part belong to the crystalline series.

These building stones, although excellent in many ways, are not so good as they will be later when the quarry faces have penetrated further into the virgin rock, but when it is borne in mind that only a very limited quantity of rock has yet been removed, it is remarkable how fresh the stone is.

Although this State contains a great variety of granites, so far only one of these has been worked owing to the fact that it existed in the most accessible positions, but there is not the least doubt that in the near future other fine building stones of this class will be quarried.

The only sedimentary stone worthy of note is the Donnybrook freestone, which is now being used largely in the erection of the principal buildings of the metropolis.

ACID IGNEOUS ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (greyish-white)	Mahogany Creek, 19 miles from Perth, on Smith's Mill railway line.	Coarse-grained orthoclase-biotite granite sometimes much kaolinised.	Unlimited.	Basement, ground and 1st floor of New G.P.O., Perth, rock-faced and fine-axed work. A beautiful stone taking a high polish.
Granite (greyish-white)	Boya, 14 miles from Perth, on Smith's Mill railway line.	Medium-grained orthoclase-microcline biotite granite with chloritis-biotite scales considerably kaolinised, but occasionally micacised, while epidote grains are associated with the biotite aggregates. Appearance closely resembles that from Mahogany Creek.	Unlimited.	No buildings. Used exclusively for granite cubes for street pitching and concrete work.
Granite (greyish-white)	Meckering, 89 miles from Perth, on the Eastern Railway line.	Fine-grained chloritis biotite muscovite granite; the feldspars are orthoclase and microcline, which are kaolinised and micacised. Weight per cub. ft., 175.7 lbs.	Unlimited.	Basement of Art Gallery and Museum and Supreme Court buildings, where it stands well although looking rusty in places and rather lacking in appearance.

* Data supplied by the Secretary for Mines, Department of Mines, Perth.

ACID IGNEOUS ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Granite (greyish)	Kellerberrin, 133 miles from Perth, on the Eastern railway line.	Coarse-grained orthoclase-microcline granite with flakes of brown biotite. More or less porphyritic. Weight per cub. ft., 171 lbs.	Unlimited.	New Public Library. Has a good appearance and takes a high polish.
Granite	Roelands, 100 miles from Perth on the South Western Railway line.	Coarse-grained biotite microcline granite with large pseudo crystals of feldspar, the latter being generally kaolinised and micacised.	Unlimited.	Bunbury Breakwater.

BASIC IGNEOUS ROCKS.

Epidiorite and partially amphibolised dolerite.	Gooseberry Hill, Greenmount and Parkerville, 13 to 19 miles from Perth.	Fine-grained and consisting of hornblende, chlorite, augite, pyrites in varying amounts. Very hard and fairly fresh.	Occurs in large dykes.	Used so far for road-making and pitching.
Basalt (greyish-black)	Bunbury.	Very fine-grained sometimes porphyritic black rock, the porphyritic variety shewing large feldspar crystals.	Sheet flow or sill of considerable extent.	Used for road-making and steps to local buildings.

SEDIMENTARY ROCKS.

Slate	Bridgetown, 174 miles from Perth.	Almost flinty greenish and greenish-white rock of very imperfect fissility.	Unknown.	Not used so far. Unsuitable for roofing.
Slate (Brown-chocolate) <i>Silurian?</i>	Stirling Range, 274 miles from Perth.	Massive slate cleaving into large slabs. Not suitable for roofing owing to the imperfect nature of the fissility.	Unknown.	Not used so far.
Slate (Grey-blue to Chocolate) <i>Permo-Carb.?</i>	Armada, Beenup and Cardup, 19 to 25 miles from Perth on South Western railway line.	Massive slate cleaving into large slabs. Not suitable for roofing.	Unknown.	Used for pavements, but principally for dry-pressed bricks.
Sandstone (white through cream to yellow and brick red, also sometimes variegated) <i>Permo-Carb.?</i>	Donnybrook, 132 miles from Perth on the railway.	Fine-grained felspathic sandstone with kaolinic cement, an excellent freestone suitable for rock-faced, dressed and all sorts of tooled and carved work. Weight per cub. ft., 129 to 144 lbs.	Large number of quarries over a large area, but quantity unknown.	Upper portion of Parliament House; Supreme Court; Police Court Station and Quarters; Museum, Art Gallery and Library; A. M. P. Buildings; Millars Jarrah Forests Ltd.; G. P. O., Perth; Customs House, Fremantle; Dalgety's Buildings; Haynes, Robinson & Cox; Telephone Exchange; Bunbury Colliery and Midland Junction Court Houses; Government Stores, Perth; Public Health Offices, Perth; Perth Technical School; Fremantle Railway Station; Guilford Grammar School Chapel (sculpture and carved work); Tower and Spire of St. John's Church, Fremantle.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Calcareous Sandstone (creamy-white) <i>Eocene?</i>	Rottneat Island, 10 miles off Fremantle.	A fine-grained free-stone in which the sand grains are cemented by calcareous matter. Suitable for rock-faced dressed and when selected for tooled and carved work. Weight per cub. ft., 142.5 lbs.	In large quantity, but not now worked owing to the superiority of the Donnybrook stone.	Employed in first section of Museum Buildings and in Parliament Houses.
Calcareous Sandstone (creamy-white) <i>Eocene?</i>	Cottesloe and Fremantle.	A freestone of variable texture in which the sand grains are united by calcareous matter. Suitable for rock-faced work but not for dressing or carving.	Extensive deposits all along the coast.	Government House Ball-room, and employed extensively in the older buildings of Perth and Fremantle, but now only used for foundations.
Clay Rock (white to terracotta)	Walsh's Quarry, Kalgoorlie.	Fine-grained compact kaolinised clay rock. Soft when freshly quarried, but develops a resistant surface on exposure.	Unknown.	Public Buildings, Kalgoorlie.
Clay-shale (banded brown and white) <i>Permo-Carb.?</i>	Moora, 108 miles from Perth on Midland railway.	Fine-grained compact kaolinised shale. Fairly resistant to absorption and developing a surface on exposure. Can be worked and moulded to suit all building requirements.	Unknown.	Court House, Post Office, and Police Buildings, Moora.

Stone of a similar character has been used both at Coolgardie and Yalgoo in public buildings, and in both places it is of a red colour and looks exceedingly well when walled, but is not a good weathering material. At Mullewa, however, there is a supply of a similar stone which will probably be found suitable for building purposes.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Diatomaceous Rock (french-gray) <i>Cretaceous?</i>	Gingin and Dandaraga, 40 to 80 miles north of Perth on Midland railway.	A very fine-grained rock, composed of the siliceous shells of diatoms with a little kaolin cementing material. It is easily worked and moulded, being soft when freshly quarried, case hardens on exposure to the weather.	Unknown.	Schoolhouse and Post Office at Dandaraga, and private residences at Gingin.

6. Tasmania.*

There is an abundance of building stone in Tasmania, both igneous and stratified. In the districts where it is plentiful, it is employed for buildings, and to a larger extent for road making. The total annual output is about 70,000 tons at present, but this may be expected to increase with the general progress of trade and population.

* Data supplied by the Secretary for Mines, Dept. of Mines, Hobart.

IGNEOUS ROCKS.

Building Stone.	Locality.	Character.	Quantity.	Examples.
Basalt.	On the North Coast generally, in the North West Highlands, the Midlands and Southern Tasmania.	Compact to vesicular. A dark Tertiary basalt. Where fresh, the rock is resistant and would be fairly durable, but is mostly irregularly fissured and short jointed.	Unlimited quantities can be quarried.	The quarries in this stone have been worked only for road metal.
Diabase.	Hobart, Southern Tasmania generally, Midlands, Launceston and Northern Tasmania.	A medium grained to coarse pyroxene-felspar rock, very tough; colour, dark green to greenish grey. The rock is massive and has an irregular fracture. It is consequently difficult to dress. Numerous quarries have been opened in this stone in nearly all parts of the island.	Is available in practically limitless quantities.	It is used extensively for road metalling, road culverts, bridge work, garden walls, pavements, house foundations, and in some instances for the superstructure of buildings. Examples may be seen everywhere in Hobart and Launceston in the foundations of houses and public buildings, and on the public roads. Cottages at the Launceston Electric Generating Station are built wholly of this rock.
Gabbro and Serpentine.	Near Beaconsfield, near Dundas, in Heazlewood and Heemskirk districts, Macquarie Harbour, near Point Hibbs, near Mt. Wedge and on Styx River.	Even grained to coarsely crystalline. Some of it could be used in ornamental architecture, but generally speaking would tend to weather if employed for outside purposes. Some varieties are distinctly handsome.	Large quantities of the rock could be quarried, but the tonnage would be reduced by exclusion of unduly soft and fissured varieties.	The only quarries which have been opened in this rock are those in the Heemskirk and Heazlewood districts for road metalling, and near Beaconsfield for ornamental rock.
Granite.	N.E. and E. Tasmania, Riana, Hampshire Hills and N.W. highlands, Mt. Heemskirk and Meredith Range.	Medium to coarse grained crystalline rock, frequently porphyritic, with large crystals of felspar. Colour ranges from light grey to pink. Places for quarries would have to be selected where the rock is fresh.	Would be available in large quantities.	No quarries have been opened in granite so far, and the rock has not been utilised. With increasing population there will be a wide field open for its employment in various branches of the building art.

About 60,000 tons of igneous rock are raised annually for building and road construction.

SEDIMENTARY ROCKS.

Numerous quarries have been opened in Tasmania in Trias-Jura sandstones for building materials, and the stone obtained from them has proved of excellent service in building and decorative work. The quarries are always situated in favourable positions on or near main roads or lines of railway, and are thus easily accessible for trade. They are mostly on privately-owned land and as a rule are worked in a more or less intermittent and unmethodical manner. Still, they have supplied good stone for numerous public and private buildings in Tasmania, as well as for some important edifices in Victoria. Some of the deposits are, however, Government reserves.

About 6,000 tons of sandstone are raised annually for building.

SEDIMENTARY ROCKS—*continued.*

Building Stone.	Locality.	Character.	Quantity.	Examples.
Sandstone.	Knocklofty, Hobart Waterworks, Risdon, Bellerive, Tea Tree, Brighton, New Norfolk and other places in Southern Tasmania. At Ross, Campania, Oatlands, Okehampton, Spring Bay, and elsewhere in the Midlands and on the East Coast, on the West Tamar and in the Patersonia district.	Even grained texture, white, through pink, to light brown colour. The pinkish varieties are esteemed for ornamental stone work. When freshly quarried the stone is often rather soft and friable, but hardens with time and exposure. It is easy to dress. The quartzose varieties are sought in selecting a site for a quarry, as some of the stone, particularly when associated with the Trias-Jura coal measures is distinctly felspathic and soft. The Patersonia stone has been tested to a pressure of 10,000 lbs. to the square inch. The better varieties of sandstone are extremely durable.	About 6,000 tons are raised annually for building purposes, but much larger quantities could be obtained if the quarries were worked more regularly and systematically.	The Southern quarries have provided stone for several important public buildings, such as the Tasmanian Museum, Town Hall, General Post Office, St. David's Church, St. George's Cathedral, and numerous other buildings, both public and private. The Tea Tree and Brighton quarries have supplied stone for the Launceston Post Office. The Ross quarries have provided stone for the bridge over the Macquarie at Ross, the Ross Municipal buildings; and for St. John's Church, Commercial Bank of Tasmania, A.M.P. Building and the Commercial Travellers' Club in Launceston. The Campania quarries yielded stone for the Customs House, Hobart, The Mechanics' Institute, Launceston, is built of stone from the West Tamar quarry. Some of the stone from Patersonia has been used in the enlargement of St. John's Church, Launceston, and other buildings.
Silurian Limestones.	Ida Bay and Tyenna, Southern Tasmania; Winkleigh, Railton, Chudleigh, Mole Creek; Leven, Forth, Don, Iris and Blythe Rivers in Northern Tasmania; Queenstown and Zeehan in Western Tasmania. Gordon, Denison and Franklin Rivers in Western highlands.	Grey to dark bluish limestone, developing in places to impure argillaceous varieties. The pure stone, where unfissured and compact would be of some use for building purposes.	Large and indeterminate quantities could be obtained, but the only quarries opened hitherto are for producing agricultural and building lime, and road metal.	
Flagstones and Slates. (<i>Pre-Silurian</i>).	N. and N.W. Coasts, Surprise River, South Coast and King Island.	Dark grey to bluish. Cleavages apt to be soft jointed. Further prospecting required to locate occurrences of stone suitable for roofing and window-sills, hearthstones, etc.	Small and inconclusive trials have been made of slates on N. W. coast and King Island.	